



North Coast Regional Water Quality Control Board

Regional Water Board Comments on Eureka ERWWTP Evaluation of Ammonia Toxicity Technical Memorandum Dated November 25, 2019

Regional Water Board staff have reviewed the City's November 19, 2019 Technical Memorandum 1, *Evaluation of Ammonia Toxicity during Elk River Wastewater Effluent Mixing in Humboldt Bay* (Technical Memorandum). Regional Board staff appreciate the City's ongoing efforts to comply with the NPDES permit requirements and to protect Humboldt Bay. This email conveys Regional Board staffs' initial comments on the Technical Memorandum.

The modeling assessment of the City's discharge must be robust and well-supported. It must include sufficient detail to demonstrate that the resulting findings are defensible and show that Eureka's discharge to Humboldt Bay has ammonia concentrations that are below the required ammonia criteria in all locations and at all times, thus posing no toxicity risk.

The Regional Water Board has the following specific comments based on the modeling effort completed to date and presented in the Technical Memorandum.

1. The selection of a modeling platform should be carefully considered.

The modeling platform must provide the capability to incorporate all factors necessary to fully evaluate ammonia toxicity in Humboldt Bay. The selected software must be able to model all conditions and ensure conservative values and/or assumptions are used to mitigate the limitations of the model. The Technical Memorandum must clearly discuss how limitations of the model were mitigated.

For example, Visual Plumes is not sophisticated enough to model complex bottom shape, nearby shorelines, and tidal currents and how they change over time. These limitations must be addressed, all assumptions shown, and fully explained.

If these limitations cannot be fully addressed using Visual Plumes, a more sophisticated program such as CORMIX may need to be used.

Commented [GC1]: Pascal – is this a correct statement?

2. The intended conditions being modeled must be clearly stated.

For example, clarify that the Visual Plumes model is intended for buoyant-plume mixing (initial dilution) only and would not be used to model any other mixing or

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dilution dynamic. CORMIX should be considered if there is a need to understand more complex mixing or dilution dynamics than what Visual Plumes can model.

3. All assumptions need to be clearly stated and explained, adequate factors of safety applied, and all work and supporting calculations and documentation provided.
 - a. The Technical Memorandum must explain all modeling errors encountered and how they were addressed. It must also explain how assumptions were made and demonstrate that they are conservative in their impact on the resulting model output. This includes modeling coinciding worst case conditions, such as high background ammonia levels, high effluent ammonia concentration, and worst-case tidal mixing conditions.
 - b. The model assumed no ammonia was present in Humboldt Bay. Given the enclosed nature of the Bay, the findings of the 2014 Study that not all effluent exits the Bay on the outgoing tide, and the possibility of other sources of ammonia to the Bay, this assumption does not appear to be correct or conservative. The City is encouraged to perform a literature search and utilize any ambient ammonia data that may exist and/or conduct additional sampling to support and verify the model. If no data is available, a conservative assumption should be used and fully explained and justified.
 - c. The model was run with an effluent ammonia concentration that is lower than values that have been recorded in the discharge. The model should be run with the a more conservative ammonia concentration based on a statistical analysis of the effluent ammonia data from the last five years. At a minimum, the model should use the maximum effluent concentration of ammonia detected during the last five years. The concentration selected should be fully explained.
 - d. The Technical Memorandum does not adequately consider the impact of the ammonia in the City's discharge on ambient ammonia concentrations within the area being modelled.
 - e. The model was run for effluent flow rates of 6 mgd and 30 mgd. Does the model adequately consider that the discharge is not continuous and occurs over two discharge periods each day?
 - f. Page 1 of the Technical Memorandum contains a statement regarding late summer/early fall conditions, implying that this represents the most sensitive conditions with regard to dilution and impacts on aquatic species. The Technical Memorandum should clearly document why this represents the most sensitive conditions.

- g. The Technical Memorandum should discuss whether there are ammonia sensitive species present on or near the outfall.
 - h. The Technical Memorandum should include the entire data set from the Fall 2019 sampling event.
 - i. The analysis and discussion should demonstrate that the plume doesn't run into any boundaries such as bottom or shoreline.
 - j. The analysis should address currents by performing model runs that include currents or give a defensible explanation as to why it is reasonable not to consider currents.
 - k. The Technical Memorandum should include the Excel spreadsheet for Table 3-2 to allow Regional Water Board staff to review all calculations in the table, particularly the calculations for unionized and total ammonia criteria. The values in the unionized criterion columns appear to less stringent than the values that result using the formulas in the U.S. EPA 1989 *Ambient Aquatic Life Water Quality Criteria for Ammonia (Salt Water)*.
 - l. The values in the Total Ammonia Criterion column for temperatures of 15 degrees appear to be the values that correspond to 20 degrees C. Please confirm that the formulas in the spreadsheet are correct.
 - m. The modelling should consider transformation of ammonia once it is discharged into the Bay.
4. A sensitivity analysis should be conducted in the model over a wide variety of conditions and with varied assumptions.

Multiple model runs should be evaluated and discussed in the Technical Memorandum along with supporting details. This effort is necessary to demonstrate that the most appropriate and conservative conditions and factor were modeled.

For example, the model should consider a wide range of discharge rates, temperatures, pH levels, ammonia concentrations in both the discharge and Humboldt Bay, and tidal conditions and how these factors may vary with depth.

5. Sampling may be needed to validate the model results if adequate data does not already exist, or if the results do not closely correlate to measured values. This ground truthing effort should be considered early in the process.

Regional Water Board staff appreciate the City's work to thoroughly analyze the impacts (or lack thereof) of ammonia in discharges from the wastewater plant. We anticipate that

the additional information requested in these comments will result in the robust analysis that will be needed to defend the results before the Regional Water Board and interested public and stakeholders.

Regional Water Board staff are available to discuss these comments with you. In order to have this requested re-evaluation of ammonia effluent limitations considered in the next permit renewal, the revised modelling evaluation should be submitted by August 1, 2020 to provide sufficient time for Regional Water Board staff review.